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Lilley, K. (2018). Surveying the surveyors: the landscape legacies of the Ordnance Survey. *British Archaeology*, 159, 22-27. <https://institutions.exacteditions.com/british-archaeology>

Published in:
British Archaeology

Document Version:
Publisher's PDF, also known as Version of record

Queen's University Belfast - Research Portal:
[Link to publication record in Queen's University Belfast Research Portal](#)

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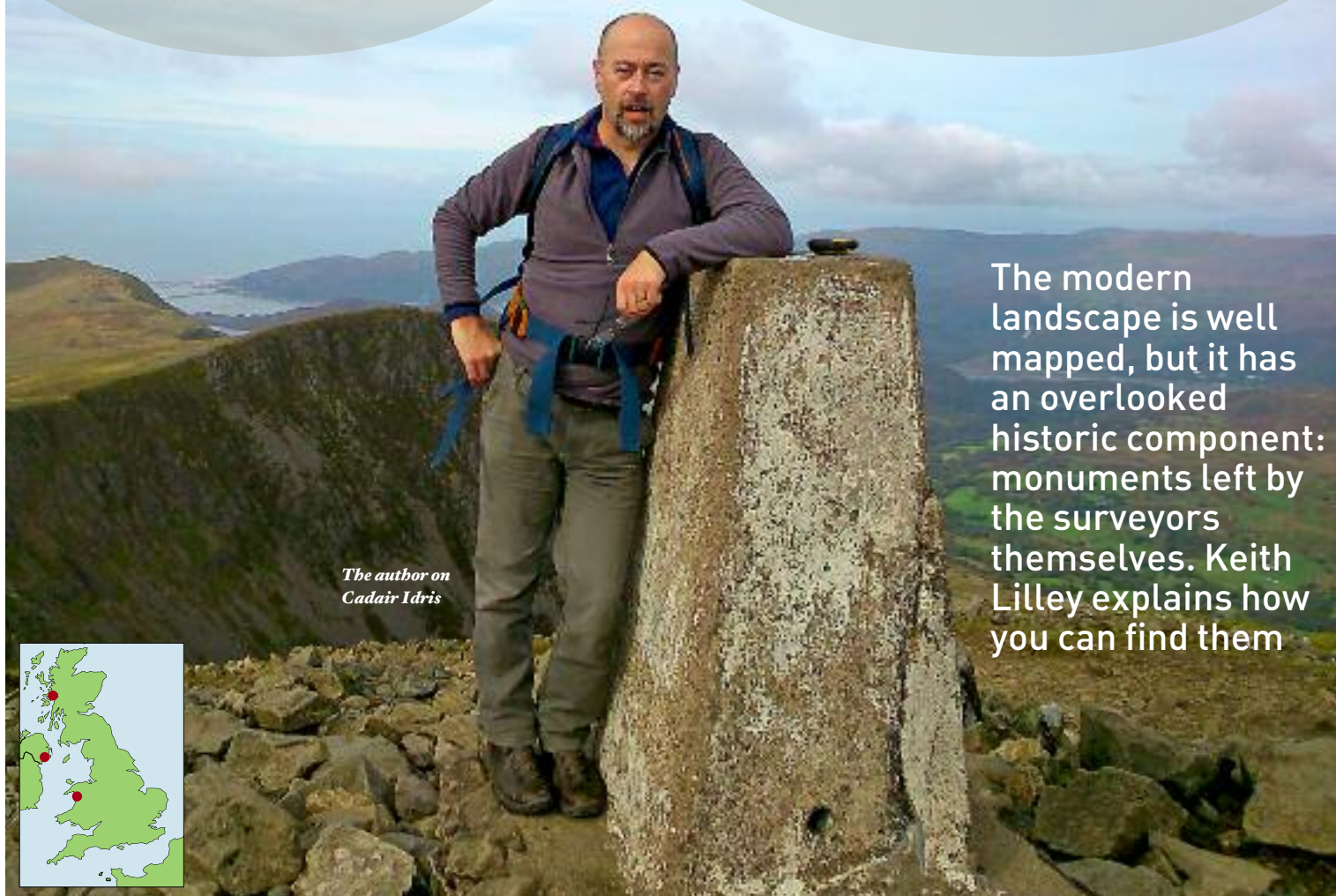
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Surveying the surveyors: the landscape legacies of the Ordnance Survey



*The author on
Cadair Idris*

The modern landscape is well mapped, but it has an overlooked historic component: monuments left by the surveyors themselves. Keith Lilley explains how you can find them



Survey is very much a part of the archaeological toolkit. Look in almost any textbook on field or landscape archaeology and there will be a chapter dedicated to how to use surveying equipment – dumpy levels, total stations, and nowadays high-tech differential GPS and GNSS (global navigation satellite systems) – to fix the locations and coordinates of archaeological features, and map them. There is another link between

by the OS from its inception and in the proposal for mapping the nation at one-inch to one mile (1:63,360). Triangulation was long known as a means for creating accurate maps through indirect measurements, by observing angles between known points such as church towers and hilltops. Proceeding from the 1790s into the 19th century, this trigonometrical survey left its mark in the British (and later Irish) landscape.

Scotland, the OS has long played a role in fostering field archaeology through recording antiquities and marking these on its larger-scale maps. Yet the OS has its own “field archaeology” in the landscape through which its past activities can be traced. This archaeology of survey relates to the fieldwork of the surveyors themselves, and one of their most important operations: triangulation.

The triangulation of Great Britain and Ireland under the OS eventually covered the two islands with a network of trigonometrical “stations” that were key to fixing the control points on which accurate mapping depended. Triangulation networks not only connected the two islands to each other, however. They also, early on in the OS’s work, linked Britain to similar networks on the near continent, in France and Belgium. The stations established in Britain and Ireland were part of this ambitious international programme of the Enlightenment in Europe, to survey and map according to the latest scientific principles using the most modern survey instruments available.

For the OS, the earliest trigonometrical recordings used a large precision instrument, the Ramsden 3-foot theodolite. Accurate observations could be made with this over a distance of up to 70 miles (110km). The disadvantage was that the instrument was delicate and cumbersome. Weighing 300lb (136kg), it had to be lugged around the country, and fixed to



Left: The early Ordnance Survey in the field – Royal Sappers and Miners, 1837

archaeology and survey, however, which is relatively rarely explored. Neglected and largely forgotten are sites and monuments constructed and used by surveyors in their fieldwork. Hidden in the upland landscapes of Britain and Ireland are legacies of the early Ordnance Survey (OS).

The OS itself is familiar to every archaeologist in these islands through its large-scale maps, used widely not just as a means of getting around but also as an important source in archaeological fieldwork and desktop study. The origins of the OS and its significance in the nation’s psyche – as much a part of British cultural identity as the BBC World Service and the WI, some would argue – is well-trodden ground, covered by numerous books, TV series and radio programmes. But so often missing from this revelry for the OS map is an appreciation of how the making of the 19th- and 20th-century maps themselves also shaped the British and Irish landscape.

The Board of Ordnance’s early work in surveying the land was concerned with creating a scientific basis for determining and calculating key points. The technique was triangulation, used

This tangible imprint of the surveyors’ work offers some interesting archaeological insights into how the OS and its surveyors operated some 200 years ago.

Occupying summits

From its earliest days beginning under William Roy in the 1740s and 1750s in

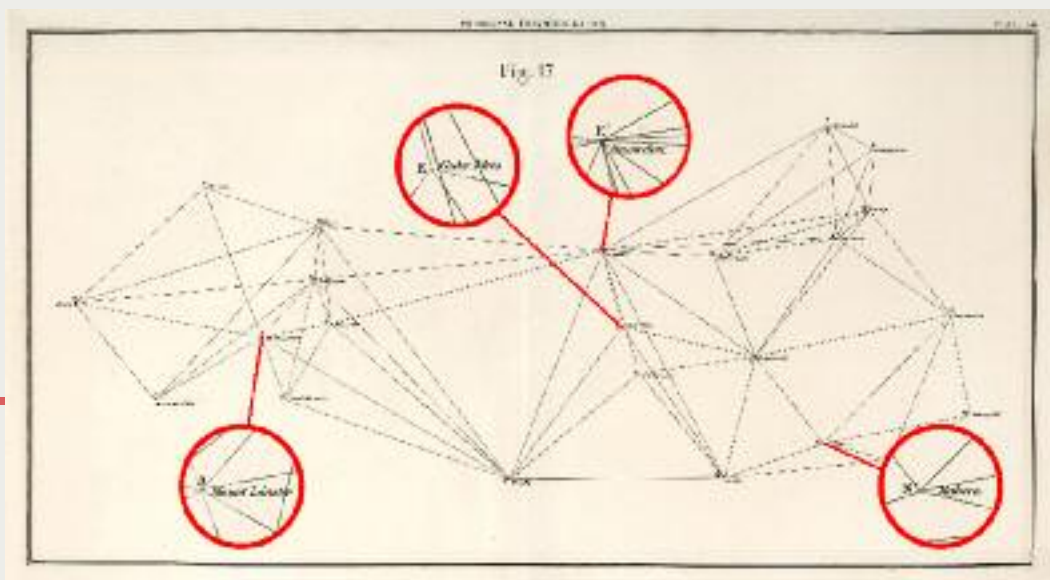
Below: Trig pillar in Wiltshire, with fittings for survey equipment; once a key part of the nation’s mapping system, such pillars have been made redundant by satellite data and are no longer maintained or monitored by the OS for geodetic purposes



KEITH LILLEY, M. PITTS

pecially chosen stations in high places. In the south and east of Britain, these points were usually church towers. In the upland areas to the north and west, however, and also in Ireland as a whole, the sites chosen for stations were invariably elevated landforms such as hilltops and mountain peaks. For the trigonometrical survey, the Ramsden theodolite had to be placed on all of these and readings taken between the stations, often in harsh and difficult conditions.

Thus as one of the higher peaks of Wales, Cadair Idris was selected as a “principal” trigonometrical station by the early OS, forming part of the triangulation network as a whole. Anyone who has climbed to the 2,900 feet (880m) high summit will know what a challenge this is, even in



Above: Principal triangulation diagram for Wales linked with Ireland, adapted from Henry James, *Ordnance Trigonometrical Survey of Great Britain and Ireland* (1858)

the retriangulation of Britain carried out by the OS over 20 years between the 1930s and 1950s. They are no longer maintained by the OS as part of their trigonometrical network. The trig pillar is itself now an archaeological field monument, a landscape legacy of the OS's surveying work. But on Cadair Idris an earlier, 19th-century predecessor lies beneath the later OS triangulation station.

When in 1811 the third volume of William Mudge and Thomas Colby's *Account of the Trigonometrical Survey* was published, included among its appendices was “An Alphabetical List of the Latitudes and Longitudes of the principal Stations, together with several Church, Steeples, Lighthouses, and other remarkable Objects.” This long tabulated list of stations records the position of Cadair Idris with typical military precision and geographical exactitude: $52^{\circ} 42' 2''$ N and $4^{\circ} 28' 3''$ W. These coordinates for Cadair Idris make clear too that the summit had now been “occupied” by the survey team, its location



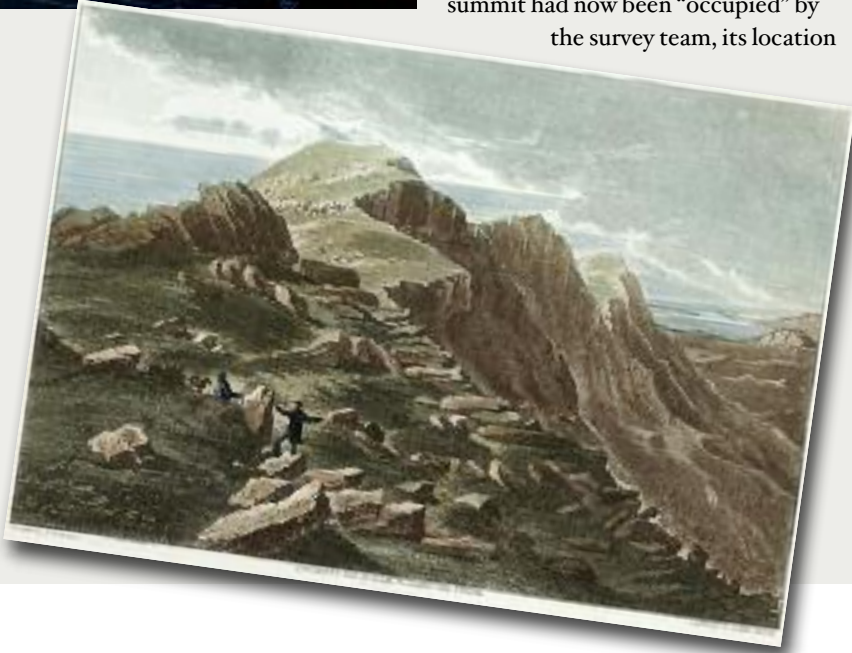
relatively benign weather. Imagine doing so carrying heavy and fragile survey equipment.

The earliest one-inch OS map notes the triangulation station on Cadair Idris with the now familiar and fairly universal sign of a triangle with a dot at its centre. It is a station that is also now marked on the ground by another familiar feature of the OS, the “trig pillar”, those sturdy concrete structures that dot the landscape, and so often form the focus of a summit photograph opportunity for hardy hill-walkers to record their achievement.

These concrete pillars belong not to the original OS survey, however, but to

Above: York Minster, site of a Board of Ordnance (later Ordnance Survey) early “principal station” of the trigonometrical survey of Great Britain

Right: Pen y Gadair, the summit of Cadair Idris, in a lithograph by T Compton published in 1818



providing further “control” for the nationwide survey.

Huts and camps

As part of this occupation of the summit of Cadair Idris – from which other distant but visible summits were observed, such as Snowdon and Plynlimon – the surveyors made their mark on the ground. As you approach the summit from the west, the later concrete trig pillar hoves into view. It sits atop what appears to be a tumbled pile of stones, a summit cairn at NGR (national grid reference) SH 711130. Survey teams involved in the 1930s and 50s retriangulation were instructed to put the new trig stations, as far as possible, on the sites of the old. To do this the original trigonometrical stations were excavated, and the survey markers buried by the first survey teams located and used to position the new concrete pillars. The pile of stones



Left: Ramsden Board of Ordnance theodolite (1791) at the Science Museum, London

at the summit of Cadair Idris beneath the later concrete trig pillar represents the tangible remains of the earlier trigonometrical station. It is not the only vestige of the surveyors’ time spent occupying the summit there in the early 1800s.



Left: Detail showing trigonometrical station at summit of Cadair Idris on Ordnance Survey Old Series one inch map of England & Wales, Sheet 59NE Machynlleth, surveyed 1816–34, revised 1834



Left: Summit cairn with trig pillar on Cadair Idris

Below and below left: Remains of structure with stone-built fireplace and iron hearth, Cadair Idris – former shelter for os survey team?



As well as the summit cairn, other stone-built structures are visible in the immediate vicinity of the trigonometrical station. The low-roofed “bothy” or hut frequented by walkers today may well be the same “small hut built near the mountain top as a place of shelter to tourists”, as the os later recorded in 1858 in a description of all the stations used in the “principal triangulation” compiled under the then director general of the os, Henry James. Nearby, however, is another, smaller stone structure, circular and with low walls.

Hardly distinguishable among the rocky ground of the summit of Cadair Idris, it is unrecorded and unknown on the heritage environment record for Wales. It has within it a small fireplace, with the remains of an iron hearth – in other words a site of occupation. Close to the summit cairn of the trigonometrical station, these stone remains have all the characteristics of a structure built by the early trigonometrical surveyors. It would have been a place of refuge while their observations were carried out, offering some protection for them and their instruments on what is an exposed and isolated site.

While these unrecorded remains on the summit of Cadair Idris are as yet not fully evaluated, their likely connections with the trigonometrical work of the early os are further endorsed by parallels with sites elsewhere. Much better known in Scotland as “Colby’s camps”, survey sites associated with the early os have been identified from archaeological fieldwork and aerial reconnaissance. Of these, the camp at Creach Bheinn in Argyllshire (NGR ONM 879576) has gained statutory protection by being listed by Historic Scotland (Canmore RCAHMS (NM85NE 2).



Above: *A substantial stone wall crosses the shallow valley at Creach Bheinn, Argyllshire, probably built as a windbreak*

Here, the summit site has a particularly impressive set of stone-built structures, including substantial windbreaks, the remains of the summit cairn itself, and a range of circular-formed stone walls built to protect the surveyors' tents. The interpretation of these physical remains at Creach Bheinn is assisted by a contemporary illustration of the camp published in 1862 in an *Aide-Mémoire to the Military Sciences*. Equally, other written contemporary accounts by the surveyors about their time on summit-top survey stations in Scotland, and indeed elsewhere in both Britain and Ireland, reveal the substantial nature of these sites. The survey work was lengthy and arduous, requiring temporary camps as well as the more permanent trigonometrical stations.

The surviving structures of the camp at Creach Bheinn are paralleled elsewhere too in Scotland, for example at Beinn an Oir, Jura (NGR NR 495749), and on Ben Alder (NN 496718), but their identification in other parts of Britain and in Ireland has been perhaps rather overlooked. Yet, as the example from Cadair Idris suggests, there is other survey archaeology still to be discovered in the field, for those willing to go and seek it out.

Lasting testimony

The challenge then is to begin to seek and record these landscape legacies of the OS, to identify sites associated with the early OS, and to survey their remains. This is not as difficult or arduous as may first appear. The 21st-century field archaeologist interested

in "surveying the surveyors" has at their disposal the means by which to identify the trigonometrical stations and locate them in the field.

Over the past few years, historic OS

maps have become more accessible to users through online resources and platforms. While not all are free-to-view, many are, including the National Library of Scotland (NLS) historic map viewer (<http://maps.nls.uk/geo/explore/#>). Such online resources for locating the landscape legacies of the OS provide archaeologists with viewable digital copies of early OS mapping. They also, by using geographical information systems (GIS), enable the historic OS maps to be compared with modern aerial imagery. Features shown by the historic map can be juxtaposed against the landscape as it is today.

Moreover, the NLS "Explore georeferenced maps" viewer contains OS one-inch to one mile maps which have been "georectified". These yield modern coordinate information for all the features they show, including the sites of early trigonometrical stations marked by the triangle with dot symbol

Right: *Sub-circular stone structures on lower slopes below summit cairn and trig station at Creach Bheinn survey camp*



Below: *"Camp of the party employed on the Ordnance Survey" at Creach Bheinn, in Aide-Mémoire to the Military Sciences by James Weale (1862)*



even in the 19th century. The principal stations of the OS listed and described in 1858 are all therefore easily identified on the maps that were produced through the survey work. Equally as important, they are now identifiable on the ground and in the local landscape by reading their modern coordinates off from the NLS map viewer.

Even before setting a foot outdoors, the NLS Explore georeferenced maps viewer with its aerial imagery enables some useful site reconnaissance of likely survey camps: the imagery itself is often sufficiently high-resolution to pick out structures in the landscape. This is the case not just for Great Britain but for Ireland too. This is important, as the trigonometrical survey of Ireland undertaken by the OS in the 1820s and 1830s formed part of the overall work of the OS, at that time under the auspices of Colonel Colby.

For Ireland, there is similar survey archaeology still to be explored in the field – and similar online resources to the NLS map viewer are available, such as the Ordnance Survey of Ireland (OSI) Geohive and the Public Record Office of Northern Ireland (PRONI) Historical maps viewer. Both of these platforms contain early OS maps (particularly the first edition six-inch to one mile mapping of the 1830s–40s) and high-resolution aerial imagery. Laying the historic map layer over the modern imagery reveals otherwise unrecorded archaeological structures on summit tops in Ireland used for the principal

triangulation, just as in Great Britain.

The contemporary written account of principal stations in Britain and Ireland, compiled in 1858 under James, refers often to particularly impressive structures marking the trigonometrical stations, in some cases cairns clearly having been specially constructed for the purpose. Similarly, accounts of life in the field by surveyors such as Joseph Portlock, who worked in Ireland and Scotland under Thomas Colby, refer to these survey camps, as well as the infrastructure associated with them.

This monumentalising of the OS in

Above: NLS Explore georeferenced maps viewer for the Cheviot OS six-inch map (1888–1913) overlaid on modern aerial imagery; mapped circular structures west of the word “Cairn” show clearly

the field through its early 19th-century survey work is a lasting testimony to those involved in mapping the nation some 200 years ago. Today, these sites and monuments of the early OS have become almost forgotten. They deserve greater archaeological recognition, repaying closer study in the field. In so doing, the archaeologist willing to “survey the surveyors” will uncover an undervalued aspect of British and Irish field archaeology, while at the same time enduring the same outdoor challenges and enjoying the same landscape vistas as the OS surveyors did themselves.

Keith Lilley, recently elected as a CBA trustee, is professor of historical geography at Queen's University Belfast ■

Below: PRONI Historical maps viewer showing early OS summit station on Slieve Donard, Co. Down. The principal triangulation station, later the site of a concrete trig pillar (green peg), was at the centre of a large cairn (large red circle); small circle highlights sub-circular stone structure perhaps associated with Colby's 1820s survey

